CHAPTER 1

INTRODUCTION

1.1 General

The research development of green construction material like concrete in civil engineering have been widely consume throughout the years. The most important aspect to be considered in this research are financial constraint, environmental compatibility and availability. In construction fields, concrete is mainly used in worldwide. Concrete is a composite that including course aggregate, fine aggregate, cement and water. The characteristic of concrete which its tends to be brittle and stronger in compression but having weakness in tension. Recent studies indicate that the researchers had been given attentions toward green building material, which benefits in reducing the environmental impact associated with the pollution and internationally promotes conservation of reducing non-renewable resources.

Recycled concrete aggregate is a waste concrete material that have been crushed and then recycled to be used as green construction material (Trčková J. et al., 2011), (Kazberuk M.K et al.,2014), (Singh S.P et al.,2016). The recycled concrete aggregate has same properties like the natural coarse aggregates but less in strength compared to the natural coarse aggregates. In order to cater the weakness of recycled concrete aggregate, additional of fibers into the mixture of concrete will helps in enhancing the strength of concrete.

Fiber reinforced concrete can be defined as the reinforced concrete contain fibrous material which increases its structural integrity (Subashini L.M et al., 2015). Fiber benefits to improve reinforced the properties of the cement and also overcome the weakness of reinforced concrete in tension. The needs to use fiber in the concrete is to be able sustain load at deflection, increase the toughness and strength. In addition, some

fiber reduces the strength of concrete and some fiber provides greater impact, abrasion and shatter resistance in concrete. It is depending on the type of fiber. Many types of fiber can be used such as steel, glass, synthetic and natural fibers. Natural fibers have the potential to improve the usage of material related to environmental friendly.

Natural fibers are one the easier to obtain the sources of the material. It is cheaper compare to other fiber and low in energy level using the technology and local manpower. However, the utilization of natural fibers is less popular in construction fields. Many types of natural fibers can be used such as sisal, coconut coir, bamboo, jute, and sugarcane bagasse. Sisal fiber reinforced concrete has been used in making roof tiles, pipes and tanks. The natural fibers used in this investigation are kenaf fibers as known as Hibiscus cannabinus.

Kenaf is one of the most generally used natural fibers in the concrete mixture. Currently, there are many new usages of kenaf including building material, absorbents, animal feeds and paper product. Furthermore, kenaf have two components which are bast and core fibers. Advantages of natural fibers include increased toughness, enhanced cracking behaviour, enhanced durability and improved fatigue (Elsaid,2010).

A part from these, the implementation of additive the hybrid fibers, which are kenaf and steel in concrete mixture will enhance the delay in term of propagation of the concrete crack. The potential of hybrid fibers can enhance the increasing the strength of the concrete by using kenaf and steel added in reinforced beam structure can obtain the higher ultimate load compare to control beam. Moreover, gaining higher ultimate load is the main focus to improve the strength of the concrete with hybrid fibers. Indirectly will increase the flexural and compressive strength and reduce the deflection of the beam.

1.2 Problem Statement

Recycled and reused of construction materials are related to the concept of sustainable building that use the green building material in design and construction fields. (Roodman et al,1995) mentioned the activities of building and construction consume three billion tons of raw materials for one year or forty percent from the total use by people worldwide. It will be a matter for the development of building due to the reduction of material sources followed by years. A part form these, other alternative can be used to solve the problem involved by using the green material in the design of the building.

Green building material is a renewable material. The effect of using green material is it can reduce the environmental impact associated with the pollution and internationally promotes conservation of reducing non-renewable resources. Recycled concrete aggregate are waste material that have been crushed and then recycled to be used as green building material in the structure design. Most of concrete mixture that use recycled aggregate usually have low in strength compared to normal concrete mixture.

1.3 Objectives of Study

The objectives of these studies are:

1. To study the behaviour of 50 % of coarse aggregates replaced by recycled aggregates in reinforced beam added with hybrid fibers (kenaf and steel).
2. To study the effect of hybrid fibers (kenaf and steel) on reinforced recycled concrete aggregate beam.

1.4 Scope of Study

The study is conduct based on specific scope in order to ensure the specified scope of the study area. The characteristic of the recycled concrete beam produced are follow the specification based on Reinforced Concrete Design Manual Book, Euro code 2 (2nd Edition). The test on the specimens (beam) are conducted in structural laboratory in UMP, Gambang.

The properties of the beam:

1. Number of beams need to be constructed: 4
    i. Standard control beam (NRCB),
    ii. Beam with 50 % of recycled concrete aggregates replaced coarse aggregates added with 0 % volume of hybrid fibers (RAB0),
    iii. Beam with 50 % of recycled concrete aggregates replaced coarse aggregates added with 1 % volume of hybrid fibers (RAB1),
    iv. Beam with 50 % of recycled concrete aggregates replaced coarse aggregates added with 2 % volume of hybrid fibers (RAB2).

2. Dimension of each beam: 150 mm x 200 mm x 1500 mm
3. Nominal concrete cover: 25 mm